

FINAL REPORT
AOARD 05-4029 (?)

**Microstructural Evolution of Commercial-Purity
Ti and Superplasticity of Ti-6Al-4V alloy
Processed by Equal Channel Angular Extrusion**

Prof. Dong H. Shin
Department of Metallurgy and Materials Science
Hanyang University, Ansan
Kyunggi-Do 425-791
Korea

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 08 DEC 2006		2. REPORT TYPE Final Report (Technical)		3. DATES COVERED 20-12-2004 to 06-12-2006	
4. TITLE AND SUBTITLE Microstructural evolution of commercial-purity Ti and superplasticity of Ti-6Al-4V alloy processed by equal-channel angular extrusion			5a. CONTRACT NUMBER FA520905P0175		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Dong Shin			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Hanyang University,Kyunggi-Do,Ansan ,Korea (South),KE,425791			8. PERFORMING ORGANIZATION REPORT NUMBER AOARD-054029		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) The US Resarch Labolatory, AOARD/AFOSR, Unit 45002, APO, AP, 96337-5002			10. SPONSOR/MONITOR'S ACRONYM(S) AOARD/AFOSR		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT This project focused on deformation processing, microstructural development, and mechanical properties of Ti and Ti-6Al-4V alloys. Specific tasks included: (1) Study superplastic deformation of a Ti-6Al-4V alloy that have been processed by equal channel angular extrusion and relate the deformation mechanism to the enhancement of superplasticity, and (2) Examine the effect of strain path for Ti fabricated by equal channel angular extrusion and uniaxial compression, with a special focus on the improved mechanical properties of the deformed Ti. As a part of the report, two papers were published in Materials Science and Engineering A (vol.A410-411, 2005, 156-159) and Metallurgical and Materials Transactions A (vol.37, 2006, 381-391). The work was begun under AOARD 034023, ?Microstructure development of ultrafine grained Ti and superplasticity of Ti-6Al-4V alloy.? Most of that effort was devoted to Ti-6Al-4V alloy. Much progress has been made over the more than two years of effort. We propose to complete our studies by studying, in detail, deformation mechanisms for the enhanced superplasticity in the ultrafine grained Ti-6Al-4V alloy with a special focus on the role of non-equilibrium grain boundaries.					
15. SUBJECT TERMS Titanium Alloy, Materials Processing, Metals and Alloys					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 3	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Overview

This project focused on deformation processing, microstructural development, and mechanical properties of Ti and Ti-6Al-4V alloys. Specific tasks included: (1) Study superplastic deformation of a Ti-6Al-4V alloy that have been processed by equal channel angular extrusion and relate the deformation mechanism to the enhancement of superplasticity, and (2) Examine the effect of strain path for Ti fabricated by equal channel angular extrusion and uniaxial compression, with a special focus on the improved mechanical properties of the deformed Ti.

The following report is composed of two papers those were published in Materials Science and Engineering A (vol.A410-411, 2005, 156-159) and Metallurgical and Materials Transactions A (vol.37, 2006, 381-391). In addition to colleagues at Hanyang University, collaborators were Prof. Chong Soo Lee of POSTECH (who was also under contract to AOARD) and Dr. Lee Semiatin of the Materials and Manufacturing Directorate, Air Force Research Laboratory, Wright-Patterson Air Force Base.

The work was begun under AOARD 034023, "Microstructure development of ultrafine grained Ti and superplasticity of Ti-6Al-4V alloy." Most of that effort was devoted to Ti-6Al-4V alloy. Much progress has been made over the more than two years of effort. We propose to complete our studies by studying, in detail, deformation mechanisms for the enhanced superplasticity in the ultrafine grained Ti-6Al-4V alloy with a special focus on the role of non-equilibrium grain boundaries.

